(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3: 24.12.2008 Bulletin 2008/52

(43) Date of publication A2: 05.12.2007 Bulletin 2007/49

(21) Application number: 07108423.0

(22) Date of filing: 17.05.2007

(51) Int Cl.: F25B 9/00 (2006.01) F25B 43/02 (2006.01) F25B 31/00 (2006.01)

F25B 40/00 (2006.01) F25B 31/00 (2006.01)

(84) Designated Contracting States:

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR

Designated Extension States:

AL BA HR MK RS

(30) Priority: 30.05.2006 JP 2006149628

(71) Applicant: Sanden Corporation Isesaki-shi, Gunma 372-8502 (JP)

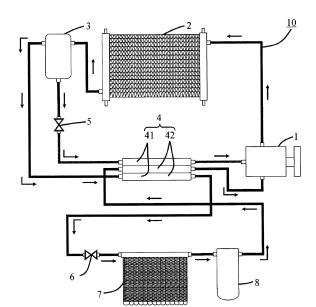
(72) Inventors:

- Matsumoto, Yuuichi Isesaki-shi Gunma 372-8502 (JP)
- · Tsuboi, Masato Isesaki-shi Gunma 372-8502 (JP)
- · Suzuki, Kenichi Isesaki-shi Gunma 372-8502 (JP)
- (74) Representative: Haley, Stephen Gill Jennings & Every LLP **Broadgate House** 7 Eldon Street London EC2M 7LH (GB)

(54)**Vapor Compression Refrigeration Cycle**

(57)A vapor compression refrigerating cycle (10) has a compressor (1), a radiator (2), an oil separator (3) for separating the refrigerant radiated by the radiator (2) into refrigerant and oil containing a small amount of refrigerant, a first pressure reducer (6), an evaporator (7), and an accumulator (8), wherein a second pressure reducer (5) for reducing a pressure of the oil containing a small amount of refrigerant separated by the oil separator (3) and an inside heat exchanger (4) for exchanging heat between the refrigerant separated by the oil separator (3) and the oil containing a small amount of refrigerant reduced in pressure by the second pressure reducer (5) are provided, and the oil containing a small amount of refrigerant is injected into a midway of the compression step of the compressor (1) after being passed through the inside heat exchanger (4). Utilizing the oil containing a small amount of refrigerant separated by the oil separator, the performance of the refrigerating cycle is improved, and it becomes possible to integrate respective equipment with each other, and while the refrigeration ability can be increased, problems on space and weight can be solved.

FIG. 1



EP 1 862 749 A3



EUROPEAN SEARCH REPORT

Application Number EP 07 10 8423

| Category | Citation of document with ir of relevant pass | ndication, where appropriate, ages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) | |
|---|---|--|--|---|--|
| Х | JP 2000 274890 A (N CORP) 6 October 200 * paragraph [0021] figure 3 * | 1,5-7 | INV. F25B9/00 F25B40/00 F25B43/02 | | |
| Y | EP 0 924 478 A (CAR 23 June 1999 (1999- * paragraph [0015] figure 3 * | 1-3 | ADD. F25B31/00 | | |
| Y | EP 0 976 991 A (ZEX VALEO CLIMATE CONTR 2 February 2000 (20 * paragraph [0020] figure 1 * | 1-4 | | | |
| Х | JP 2001 027460 A (MCORP) 30 January 20 * paragraph [0032] figures 5-7 * | | 1 | | |
| A | * figures 2,12 * | | 2 | TECHNICAL FIELDS SEARCHED (IPC) | |
| A | EP 1 647 783 A (MIT [JP]) 19 April 2006 * figure 1 * | SUBISHI ELECTRIC CORP (2006-04-19) | 1,2 | F25B F28D | |
| Х | EP 1 394 479 A (SAN 3 March 2004 (2004- * figures 3-7 * | 1,5-7 | | | |
| Υ | JP 2002 333221 A (M LTD) 22 November 20 * figure 2 * | 4 | | | |
| А | "2002 Ashrae Handbook, Refrigeration" 2002, ASHRAE, ATLANTA, XP002503576 * page 2.31, right-hand column * | | 1 | | |
| | The propert search report has | ocon drawn up for all claims | | | |
| The present search report has been drawn up for all claims Place of search Date of completion of the search | | | | Examiner | |
| | Munich | 12 November 20 | | zilagyi, Barnabas | |
| X : part Y : part docu | ATEGORY OF CITED DOCUMENTS icularly relevant if taken alone icularly relevant if combined with another the same category nological background | E : earlier patent after the filing ner D : document cit | ciple underlying th document, but pu | e invention blished on, or | |

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 07 10 8423

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-11-2008

| | atent document d in search report | | Publication date | Patent family member(s) | Publication date |
|------|--------------------------------------|---|------------------|--|---|
| JP | 2000274890 | A | 06-10-2000 | NONE | • |
| EP | 0924478 | Α | 23-06-1999 | NONE | |
| EP I | 0976991 | A | 02-02-2000 | DE 69908716 D1 DE 69908716 T2 JP 2000046420 A US 6250099 B1 | 17-07-200 15-01-200 18-02-200 26-06-200 |
| JP : | 2001027460 | Α | 30-01-2001 | JP 3439178 B2 | 25-08-200 |
| EP | 1647783 | Α | 19-04-2006 | JP 2006112753 A US 2006080989 A1 | 27-04-200 20-04-200 |
| EP | 1394479 | А | 03-03-2004 | CN 1485584 A EP 1970646 A1 EP 1970644 A1 EP 1970645 A1 EP 1972870 A2 KR 20040020013 A US 2004040339 A1 | 31-03-200 17-09-200 17-09-200 17-09-200 24-09-200 06-03-200 04-03-200 |
| JP | 2002333221 | | 22-11-2002 | NONE | |
| | | | | | |
| | | | | | |

FORM P0459 For more details about this annex : see Official Journal of the European Patent Office, No. 12/82